

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: GAECHTER, Jean-Pierre

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TITLE: MECHANICAL ACTUATOR INCLUDING A HELICAL-CAM NUT

Amendment A: CLAIM AMENDMENTS

Claims 1 - 18 (canceled).

19. (new) An actuator comprising:

an outer tubular body;

an inner tubular body having a portion positioned inside said outer tubular body;

a nut assembly interconnected to said inner tubular body, said nut assembly having at least one helical ball race, the helical ball race having a helical portion extending circumferentially for less than 360° around said nut assembly, said helical ball race having a widened portion connecting to a first end and to a second end of said helical portion;

a plurality of balls received between the helical ball race and an inner surface of said outer tubular body, said widened portion defining a re-circulation zone for said plurality of balls; and

a driving means cooperative with said nut assembly for rotating said nut assembly so as to displace said outer tubular body relative to said inner tubular body, said inner surface of said outer tubular body having a helical ball race suitable for guiding said plurality of balls.

20. (new) The actuator assembly of Claim 19, said inner surface of said outer tubular body having a helical pitch substantially equal to a helical pitch of the helical ball race of said nut assembly.

21. (new) The actuator assembly of Claim 19, said at least one helical ball race comprising a plurality of ball races, the recirculation zones of said plurality of ball races being not aligned with a direction of the displacement of said outer tubular body.

22. (new) The actuator assembly of Claim 21, said plurality of ball races being evenly angularly disposed about the direction of displacement.

23. (new) The actuator assembly of Claim 19, said nut assembly having a plurality of aligned elements each of cylindrical shape, each of said plurality of aligned elements having at least one bevel defining a helical cam surface, the helical cam surface of one of said plurality of aligned elements defining the helical ball race with the helical cam surface of another of said plurality of aligned elements.

24. (new) The actuator assembly of Claim 23, each of the helical cam surfaces defining a setback, a pair of said plurality of aligned elements being positioned with respect to each other such that the setbacks thereof face each other, the setbacks defining the recirculation zone.

25. (new) The actuator assembly of Claim 23, said plurality of aligned elements being tightenable with respect to each other.

26. (new) The actuator assembly of Claim 25, further comprising:
a nut member cooperative with said plurality of aligned elements so as to adjust the tightening of said plurality of aligned elements.

27. (new) The actuator assembly of Claim 26, further comprising:
a spring interposed between said nut member and said plurality of aligned elements.

28. (new) The actuator assembly of Claim 23, each of said plurality of aligned elements having a cross-section with a beveled circular edge, the helical cam surface being inclined relative to an axis of said cylindrical shape, the helical cam surface having ends connected by a setback surface of a generally conical shape.

29. (new) The actuator assembly of Claim 28, the recirculation zone being defined by the setback surface of a pair of said plurality of aligned elements.

30. (new) The actuator assembly of Claim 19, said driving means comprising:

a motor fixed within said inner tubular body.

31. (new) The actuator assembly of Claim 19, said helical ball races of said inner surface of said outer tubular body being formed by plastic distortion by said plurality of balls.

32. (new) The actuator assembly of Claim 19, said helical ball races of said inner surface of said outer tubular body defined by a spiral-shaped wire positioned within said outer tubular body.

33. (new) The actuator assembly of Claim 32, said wire comprising:

a first wire positioned within said outer tubular body, said first wire receiving said plurality of balls therein; and

a second wire having a diameter less than a diameter of said first wire and extending between windings of said first wire so as to maintain a spacing between the windings of said first wire.

34. (new) The actuator assembly of Claim 19, said helical surfaces of said outer tubular body comprising:

an interior tube molded within said outer tubular body, said interior tube having said helical ball race formed therein.

35. (new) The actuator assembly of Claim 19, further comprising:

another tubular body cooperative with said outer tubular body, said outer tubular body connected to another nut assembly such that a rotation of said another nut assembly causes a displacement of said another tubular body with respect to said outer tubular body.

36. (new) The actuator assembly of Claim 19, said outer tubular body being formed of a material selected from the group consisting of aluminum, carbon fibers and molded polymer.